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For: IMAGE SCANNING AND PROCESSING SYSTEM, METHOD OF SCANNING AND PROCESSING AN IMAGE AND METHOD OF SELECTING ONE OF A PLURALITY OF MASTER FILES COMPRISING DATA ENCODING A SCANNED IMAGE

L E T T E R

Commissioner for Patents
P.O. Box 1450
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June 27, 2003

Sir:

Under the provisions of 35 U.S.C. § 119 and 37 C.F.R. § 1.55(a), the applicant(s) hereby claim(s) the right of priority based on the following application(s):

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EUROPE	02078186.0	June 28, 2002

A certified copy of the above-noted application(s) is(are) attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fee required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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1 OF 1

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Bescheinigung | Certificate | Attestation

Die angehefteten Unterlagen stimmen mit der ursprünglich eingereichten Fassung der auf dem nächsten Blatt bezeichneten europäischen Patentanmeldung überein.

The attached documents are exact copies of the European patent application described on the following page, as originally filed.

Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

02078186.0

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

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Image scanning and processing system, method of scanning and processing image and method of selecting one of a plurality of master files comprising data encoding a scanned image

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Image scanning and processing system, method of scanning and processing an image and method of selecting one of a plurality of master files comprising data encoding a scanned image

The invention relates to an image scanning and processing system, comprising a scanner for generating a stream of data encoding a scanned image; a controller for controlling and processing data received from the scanner; and file storage means, wherein, in use, the stream of data is written to a master file saved in the file storage means, and the controller is configured to create a preview image with a lower data size than the scanned image from at least part of the data encoding the scanned image.
The invention also relates to a method of scanning and processing an image, comprising scanning an original, thereby generating a stream of data, encoding a scanned image; saving the scanned image in a master file, and creating a preview image with a lower data size than the scanned image from at least part of the data encoding the scanned image.
The invention also relates to a method of selecting one of a plurality of master files comprising data encoding a scanned image.
When scanning a number of documents, for example for electronic archiving purposes or to create copies, it is desirable that an operator can check the scanned image, to determine whether the scan is of high enough quality. It may be desirable, for instance to check whether the scan resolution is high enough to show all the details in a critical region. It is thus desired that the operator be able to select certain regions in the scanned image, and be able to view them at the resolution used to scan the original.
Examples of embodiments of the above-mentioned method for scanning a document, and image scanning and processing system are known from EP-A-0 589 724. This publication relates to an electronic image processing system. In this system, an initial high-resolution image is held in a high capacity storing means. The system comprises a small capacity high speed storing means and is arranged to transfer portions of the initial high-resolution image thereto a portion at a time. The system also comprises a viewing store for storing data representing an image to be displayed and a monitor for displaying the image. The system is arranged to operate in a preview mode. In this preview mode, image data is down converted and written to a destination area for output to the viewing store. The down-conversion of the data is performed by the control

processor.

In the prior art, if an operator wishes to select a section from the scanned image, a preview image of the entire scanned image would have to be created first. This requires processing of all the data comprised in the master file. From a display of the preview image, the user would be able to select a section of the scanned image. This could then be retrieved from the master file for display. Such a process is time consuming and strains the processing capacity of the controller and its memory to the utmost. Additionally, if one wanted to check a second area, the whole process would have to be repeated again.

It is an object of the invention to provide a system and methods according to the preambles of claims 1, 2 and 13, respectively allowing handling of scanned imag s with a large data size in a speedy and efficient way.

This object is achieved with the system according to the invention, which is characterised in that the controller is configured to extract data encoding the preview image from the stream of data, and to write the extracted data to a thumbnail file .

The method of scanning and processing an image according to the invention is characterised in that data encoding the preview image is extracted from the stream of data, and written to a thumbnail file.

Thus, a small file is quickly made available. Even though it is a small file, it is representative of the entire area of the scanned image. Because it is created directly from the stream of data, it is available directly after, or even before the scanning is finished. It can be used for a quick check of the scanning process, in a graphical user interface to select part of the scanned image, or visually to provide other information relating to the scanned image, without requiring processing of large amounts of data comprised in the master file.

Preferably, at least part of the preview image is displayed to an operator as a survey view in a window on a display.

Thus, it is possible to perform a quick first check for obvious scanning errors, without loading any of the detailed information comprised in the master file. Original skew, scanning of the original in the wrong direction, or insertion of the original in a scanning array the wrong way up are all easily detectable.

Preferably, the part of the preview image is displayed before or during the saving to the thumbnail file.

Thus, the first check can be performed at the earliest possible moment. This allows an operator to break off the scanning process before the entire original has been scann d.

In a preferred embodiment, part of the scanned image representing a region of interest is displayed to an operator as a detailed view of the region of interest in a window on a display.

Thus, it is possible to perform a more detailed check of the scanned image stored in the master file, without having to retrieve the entire master file and process all the data contained therein. By checking a critical part of the scanned image, for example a part containing very finely spaced lines or small text, an impression can be gained whether all details in the original have been captured by the scanning process.

A preferred embodiment of the method according to the invention comprises providing a selection frame in the survey view, wherein an operator selects the region of interest by sizing and positioning the selection frame in the survey view.

Thus, it is possible to select and view any desired portion of the scanned image. Selection is extremely easy, since it can be done with reference to the scanned image, but it is not necessary to load the entire scanned image stored in the master file. Thus, resources are spared and time is saved.

In one embodiment of the invention, the part of the scanned image representing the region of interest is converted to a different data format before being displayed.

Thus, it is possible not only to assess the quality of the scan, but also to see the effect that conversion of the data encoding the scanned image will have. This embodiment is particularly appropriate when scanning to file for archiving purposes. It allows selection of a suitable file format for storing the scanned image and/or for choosing scanning settings appropriate to a chosen file format.

In a further development of this embodiment, the part of the scanned image representing the region of interest is compressed when converted to the different data format and decompressed before being displayed.

Thus, it is possible for an operator to assess whether compressing the scanned image before storage and decompressing after retrieval will result in a poor rendering of the original image or not. It is thus possible to prevent loss of detail when storing to file in a compressed format for archiving purposes or for transmission of the scanned image. In each case, the entire scanned image need not be processed for the purpose of assessment by the operator. Rather, the operator can select a region of interest containing elements allowing him to form a judgement on the image quality. Only the data encoding this region of interest need be processed.

In a preferred embodiment of the invention, the scanned image is checked for artefacts, and information specifying detected artefacts is provided with the preview image.

According to an aspect of the invention, a method of selecting one of a plurality of master files comprising data encoding a scanned image, such as can be created using a method according to any one of claims 2-12, is provided, wherein at least part of a thumbnail file comprising data encoding a preview image corresponding to the scanned image with a lower data size than the scanned image is sent to an archive manager, and wherein the archive manager displays the parts as survey previews to the user. Thus a particularly responsive and informative user interface is provided for selecting archived images. Due to the survey previews, the user knows which image is stored in each master file. Because the thumbnail is already present, it is not necessary to scale down each master file in turn to build up the display.

The invention will now be explained in further detail with reference to the accompanying drawings.

Fig. 1 is a simplified component diagram comprising an embodiment of a system according to the invention.

Fig. 2 is a schematic illustration of an embodiment of the system.

Fig. 3 is a schematic cross-sectional diagram of an embodiment of scanning device for use in connection with the invention.

Fig. 4 is a schematic example of a screen view, provided during execution of an embodiment of the method according to the invention.

Fig. 5 is a flow diagram showing an embodiment of the method according to the invention.

The system according to the invention comprises a scanner 1 for scanning an original. The scanner 1 can be part of a copier or part of a stand-alone device. Fig. 2 shows a scanning device 2 of the latter type.

The scanning device 2 is a throughput scanner, meaning that it comprises a stationary scanning array, and a feeder mechanism for moving an original past the scanning array. The invention can, however, also be implemented using a flatbed-scanning device, in which the scanning array is moved across the original.

A schematic cross-sectional view of the scanning device 2 is shown in Fig. 3. The original is placed on an original table 3, and pulled through the device by a feeder mechanism, comprising two pairs 4, 5 of transport rollers. The device 2 comprises a light source 6 and a transparent plate 7 for guiding the original sheet. The transparent plate 7 provides an exposure area 8. Light from the light source 6 is projected along an optical path (shown as a dashed line) onto a CCD array 9, an array of charge coupled devices.

The invention can be used for scanning any type of image, on any type of original, but is particularly useful for scanning wide format originals comprising colour images with randomly distributed areas containing small details. Engineering drawings are a typical example of such originals. Although the maximum width of the original is determined by the width of the scanning array 9, the length is not limited by the physical dimensions of the scanning device 2.

The scanning device 2 is capable of scanning originals at several different resolutions and in several different colour modes. A 1-bit black-and-white mode is possible, but a 24-bit full colour mode is equally possible. In this case, each sample point results in a 24-bit data element. A DIN-A0 sized original, scanned in a 24-bit full colour mode at 600 dots per inch resolution will result in the image on the original being encoded in approximately 1.6 Gbytes of data.

The system comprises a controller 10 for controlling and processing the data received from the scanning array. The term controller in this context is used to denote a combination of hardware and software that performs specific functions in the scanning and processing system. This includes coordination of the various steps needed to scan and process an image, execution of a large number of these steps, and the directing of data streams between the various other components of the system.

In the system of Fig. 2, the controller 10 substantially comprises of a series of software modules on a workstation 11. Alternatively, the controller 10 or part of the controller 10, could be comprised in the scanning device 2. In this embodiment, the workstation 11 is a computer with at least one processor, random access memory, a hard disk and graphics and network cards.

In operation, the original is transported by the pairs 4,5 of rollers along the plate 7 and across the exposure area 8. The light source 6 illuminates the original sheet at the exposure area 8. An image line of the original document at the image plane is projected via the optical path on the CCD array 9. Electrical signals generated in the elements of the CCD array 9 in correspondence with the line image in the exposure area are read out in parallel and placed in a line buffer. The line buffer is read out for further processing.

In the embodiment of the method according to the invention which is illustrated in Fig. 5, in a first step 12, the data encoding the scanned image is passed in a stream from the scanner 1 to the controller 10, where it is processed. According to the invention, the controller creates a separate stream of data encoding a preview image with a lower data size from the stream of data coming from the scanner 1. In other words, the original

Image is scaled down.

There are a number of ways in which the original image can be scaled down. The invention can use any one of them. Pixel sub-sampling is a basic example of a scaling method. In pixel sub-sampling the bit map is resampled; e.g. for a scaling factor of 1:100, ninety-nine pixels over one are removed in both directions. This method has the advantage of being fast. Other methods are, for example, random pixel sub-sampling and black pixel conservation. These methods have the advantage of reducing the data size with a less severe loss of information. Scaling down is carried out on the stream of data that has been read out as it arrives at the controller 10. The preview image is thus generated on the fly.

The extracted data encoding the preview image is written to a thumbnail file, stored on storage means 13, connected to the controller 10. The storage means 13 can, for example, comprise a solid state memory and/or a magnetic hard disk. In the implementation of the system in Fig. 1, they can be a hard disk in the scanning device 2, in the workstation 11, or a replaceable storage medium.

The primary stream of data, which encodes the scanned image in a format with a higher data size, is written to a master file on storage means 13.

Because the preview image encoded in the thumbnail file has a much smaller data size, it can be retrieved quickly and transferred between devices quickly without requiring databuses or network connections with a high bandwidth.

The system of Fig. 1 additionally comprises means 14 of display. In the system of Fig. 2, these means 14 comprise a display 15 in the scanning device 2 and a monitor 16 connected to the workstation 11.

A screen view 17 is provided in Fig. 4. The screen view 17 comprises a first window 18, in which a survey view 19 is provided, generated from the preview image. The survey view 19 can comprise all or part of the preview image. A system in which the operator can specify an area of the image to be used to provide the survey view 19 falls within the scope of the invention.

Completion of the generation of the thumbnail file marks the start of operation of the system. In one embodiment, the survey view 19 is displayed after scanning, once th thumbnail file has been completely stored.

In an advantageous alternative embodiment, the survey view 19 is built up on the fly, by directing the data stream encoding the preview image to the means 14 of display as well as to the thumbnail file. Thus, the operator can break off the scanning process if an error is detected halfway through.

In a preferred embodiment the scanning process comprises an image-processing step on the primary stream of data before creation of the preview image. The image processing is preferably carried out on the stream of data read from the line buffer, i. . on the fly, to decrease the burden on the controller 10. As an example, automatic background compensation can be carried out at this stage. By carrying out this algorithm on the fly, account can be taken of gradual variations in background intensity level across a very large image. Alternative image processing algorithms that can be carried out on the primary data stream from which the master file and thumbnail file are created, include gamut mapping, deskewing and despeckling.

The survey view 19 is provided for two purposes. Firstly, it allows an operator to gain a quick first impression of the quality of the scanned image. Secondly, it is used to provide a graphical means of selecting an area of the scanned image encoded in the master file, in order to carry out a check of the quality of this scanned image, and also in order to check the legends for identification.

For this purpose, the first window 18 comprises a selection frame 20, laid over the survey view 19. Input means 21 are provided with the system with which an operator can size and position the selection frame 20 within the first window 18 to select a Region of Interest (ROI).

It will be understood that the input means 21 can comprise buttons on a control panel 22 of the scanning device 2 or a mouse 23 or keyboard 24 connected to the workstation 11. This will depend on the chosen implementation of the means of display 14, and is not essential to the invention.

The screen view 17 of Fig. 4 comprises a second window 25, comprising a detailed view 26 of the scanned image. The detailed view 26 corresponds to the ROI, but it is generated from the master file. The detailed view 26 thus allows a more thorough check of the quality of the scanned image encoded in the master file. By resizing and/or positioning the selection frame 20 within the first window 18 or by operating scroll bars (not shown) of window 25, the operator can select that area of the image that enables the most effective check of the quality. For example, this can be the annotation or a hatched area in a scanned engineering drawing. The default position of the selection frame 20 is at the legends.

Of course, the invention is not dependent on a particular arrangement of the detailed view 26 and the survey view 19. For example, other implementations of the invention are possible, wherein the detailed view 26 and the survey view 19 are presented in one window, for example, wherein the part of the survey view 19 defined by the selection

frame 20 is replaced by the detailed view 26 of the ROI. Alternatively, the first and second windows 18,25 can be sequentially displayed.

In a further developed embodiment of the invention, the scanned image is checked for artefacts in step 12 and information specifying detected artefacts is provided with the preview image. The image-processing step is used to check for artefacts, so the check of the image is also carried out by analysing the data in the primary data stream on the fly.

An artefact in this context is a part of the encoded image that possesses certain predefined characteristics. Usually, this will be a departure from the normal, expected characteristics, indicative of a problem in the scanning process. For example, when certain lines are consistently black in a scan generated with the CCD array 9, this could be indicative of a contamination of the scanner 1. A uniformly grey area might be indicative of an area of considerable detail that is not adequately captured due to a scanning resolution that is too coarse.

An indication of the location and, optionally, the type of detected artefact is provided with the data destined for the thumbnail file. This indication is used to display automatically the affected area in the survey view 19 and/or the detailed view 26. As an enhancement, the area can be highlighted, for example in a different colour, in the survey view 19 and/or the detailed view 26, to draw the attention of the user. The type of artefact can be made known to the user, for example by using a different type of highlighting, an annotation, or some other means. Especially if the data encoding the preview image and the detected artefact is directly used to create the survey view 19, the user thus has at his disposal a means for quickly and automatically detecting problems in the scanning process. Scanning of the original can thus be cancelled at an early stage, if the user deems it necessary. If the artefact is not problematic, scanning can continue as normal.

In step 27 of the flow diagram of Fig. 5, a scale ratio is used to translate coordinates (x_T, y_T), representing the centre point of the selection frame 20, in the preview image in th thumbnail file to coordinates (x_m, y_m) corresponding to the same position in the scanned image in the master file. In a next step 28, the data encoding the ROI is extracted from the master file. The system then uses the extracted data to build up the detailed view 26.

In the diagram of Fig. 5, it can be seen that the system initially executes steps 27 and 28 immediately after step 12. In this initial phase, the system uses a default ROI or an ROI that has been specified in advance by the user.

A preferred embodiment of the system according to the invention allows the master file to be converted and stored in a different data format. Examples of data formats that can be used are the Graphics Interchange Format, Tagged Image File Format, Portable Document Format and Computer Aided Acquisition and Logistics Support format.

Preferably, the controller 10 is capable of generating a compressed version of the master file. Some of the image formats just mentioned make use of a standard imag compression algorithm, in which case selection of a file format automatically entails selections of a specific compression algorithm. Other file formats allow several typ s of compression to be used. Varieties of the invention wherein compression algorithm and file format can be independently selected are possible. It is equally possible that th system provides the user a choice of file formats and then automatically selects a default compression algorithm associated with the file format.

In the embodiment for which Fig. 5 provides a flow diagram, the operator is able to choose between several types of compression, or to choose no compression at all. The system enables the operator to judge the effects of different types of compression before committing himself to one of them.

There are two categories of compression, lossy and lossless. A lossy compression algorithm results in a compressed image that comprises less information than the original. Lossy compression algorithms, for example, use a quantisation step that rounds off coefficients encoding the image. A lossless compression algorithm does not result in loss of information, but does pare down the amount of data, typically by encoding the data in a more efficient way.

Whenever a lossy type of compression has been selected, the detailed view 26 is generated by first compressing the data encoding the ROI and then decompressing the compressed data in step 29. The system then executes step 30 in which the detailed view 26 is displayed in the second window 25. Thus, the operator can judge whether the loss of data is acceptable, or whether a different file format should be chosen.

Because only the ROI is compressed and then decompressed, the operator is able to reach a conclusion fairly quickly. It is not necessary to compress the entire master file, thus saving time and processing capacity. The master file is only compressed and saved in its entirety, in steps 31 and 32, when the operator has signalled his satisfaction by issuing the appropriate command.

Preferably, the system ensures that the part of the scanned image representing the region of interest is chosen to be larger than a size leading to compression artefacts. This feature is only meaningful in combination with certain types of compression

algorithms. The algorithms decompose the image into a number of spatial frequency components. Distortion of the image occurs, when the number of pixels in the ROI is too small. In this case, the higher frequency components cannot be accurately determined. Reconstruction of the image, during decompression, will result in an image with artefacts, especially in the sections of the image adjacent to the boundaries. This can be prevented by ensuring that the ROI is large enough compared to the sample size of the compression algorithm.

Various implementations of the means of ensuring this are conceivable within the scope of the invention. It is possible to prevent a user from resizing the selection frame 20 below certain dimensions. Another variant would be to increase the size of the selected ROI to the specified minimum dimensions automatically.

Fig. 5 illustrates the fact that the user can try out several different file formats before committing himself to one of them. If the detailed view 26 generated in step 30 is not satisfactory, the file format can be changed. Steps 29 and 30 are then repeated.

If the user desires to check several parts of the image, the selection frame 20 can be resized, in which case the system returns to step 27 to generate a new detailed view 26 of the ROI that has now been selected. An automatic return to step 27 implies an embodiment of the invention wherein the detailed view 26 is automatically updated upon resizing or repositioning of the selection frame 20. In variants of the system, the access time of the file storage means 13 or the bandwidth of connections between the controller 10 and file storage means 13 could be limited compared to the amount of data encoding the image in the master file. In that case, a trigger, e.g. a user command, could be specified to start the build-up of the detailed view 26. This would make the system faster.

Finally, the user has the option to indicate his satisfaction by issuing the command to save the master file (step 40). When the user has entered the appropriate command, the master file is saved. Whenever a certain type of image compression has been specified (step 41), either explicitly or implicitly through selection of a file format that involves image compression, the master file will be compressed, in step 31, before being saved in the specified file format, in step 32.

The invention can be used both to scan documents to create an electronic archive, or for copying documents. The schematic diagram of Fig. 1 shows a printing device 33 connected to the controller 10. In Fig. 2, this is implemented in the shape of a printer 34 with a document folder and collator 35 attached. The arrangement of Fig. 2 is especially useful for generating copies of wide-format documents.

The printing device 33 can use any number of printing techniques. It can be a thermal inkjet printer, a pen plotter, or a press system based on organic photoconductor technology, for instance.

To illustrate the use of the invention in connection with an electronic archive, the system of Fig. 1 comprises several terminals 36. The terminals 36 can gain access to the file storage means 13 through a network 37. In this case, access involves the controller 10, but it will be understood that where the file storage means 13 comprise a separate server, this server would be directly connected to the network 37.

For ease of access, the thumbnail file is preferably saved with the master file. An archive manager is used to display at least part of the image encoded in the thumbnail file to the user of a terminal 36. Indeed, a number of survey previews of stored images can be provided in a menu. This enables the user to recognise the image. Because there is less data in the thumbnail file, the archive manager can build up the selection menu with the survey previews quickly, and more previews can be used. Because the thumbnail files that have originally been created during the scanning process are used, there is no need to wait for the system to recreate the survey previews from the stored master files. Thus, the user can browse through the repository of images in the stored master files.

It will be obvious to those skilled in the art that the invention is not limited to the described embodiments, but can be varied within the scope of the claims. In particular, the description is not intended to limit the invention to certain categories of image compression, being merely intended to be applicable to several of the most common types of image compression and file formats.

CLAIMS

1. Image scanning and processing system, comprising
a scanner (1,2) for generating a stream of data encoding a scanned image;
a controller (10) for controlling and processing data received from the scanner (1,2); and file storage means (13), wherein, in use, the stream of data is written to a master file saved in the file storage means (13), and the controller (10) is configured to create a preview image with a lower data size than the scanned image from at least part of the data encoding the scanned image, characterised in that the controller (10) is configured to extract data encoding the preview image from the stream of data, and to write the extracted data to a thumbnail file .

2. Method of scanning and processing an image, comprising scanning an original, thereby generating a stream of data, encoding a scanned image; saving the scanned image in a master file, and creating a preview image with a lower data size than the scanned image from at least part of the data encoding the scanned image, characterised in that data encoding the preview image is extracted from the stream of data, and written to a thumbnail file.

3. Method according to claim 2, wherein the preview image is a lower resolution rendition of at least part of the scanned image.

4. Method according to claim 2 or 3, wherein at least part of the preview image is displayed to an operator as a survey view (19) in a window (18) on a display (14,15,16).

5. Method according to claim 4, wherein the part of the preview image is displayed before or during the saving to the thumbnail file.

6. Method according to any one of claims 2-5, wherein part of the scanned image representing a region of interest is displayed to an operator as a detailed view (26) of the region of interest in a window (25) on a display (14,15,16).

7. Method according to claims 4 and 6, comprising providing a selection frame (20) in the survey view (19), wherein an operator selects the region of interest by sizing and positioning the selection frame (20) in the survey view (19).

8. Method according to claim 6 or 7, wherein the part of the scanned image representing the region of interest is converted to a different data format before being displayed.

9. Method according to claim 8, wherein the part of the scanned image representing the region of interest is compressed when converted to the different data format and decompressed before being displayed.

10. Method according to claim 9, wherein the part of the scanned image representing the region of interest is chosen to be larger than a size leading to compression artefacts.

11. Method according to any one of claims 2-10, comprising an image-processing step on the stream of data before creation of the preview image.

12. Method according to any one of claims 2-11, wherein the scanned image is checked for artefacts, and wherein information specifying detected artefacts is provided with the preview image.

13. Method of selecting one of a plurality of master files comprising data encoding a scanned image, such as can be created using a method according to any one of claims 2-12, wherein at least part of a thumbnail file comprising data encoding a preview image corresponding to the scanned image with a lower data size than the scanned image is sent to an archive manager, and wherein the archive manager displays the parts as survey previews to the user.

ABSTRACT

An image scanning and processing system, comprises a scanner (1,2) for generating a stream of data encoding a scanned image; a controller (10) for controlling and processing data received from the scanner (1,2); and file storage means (13). In us , the stream of data is written to a master file saved in the file storage means (13). The controller (10) is configured to create a preview image with a lower data size than the scanned image from at least part of the data encoding the scanned image. The controller (10) is configured to extract data encoding the preview image directly from th stream of data, and to write the extracted data to a thumbnail file .

A method of scanning and processing an image, comprises scanning an original, thereby generating a stream of data, encoding a scanned image; saving the scanned image in a master file, and creating a preview image with a lower data size than the scanned image from at least part of the data encoding the scanned image. Data encoding the preview image is extracted from the stream of data, and written to a thumbnail file.

1/3

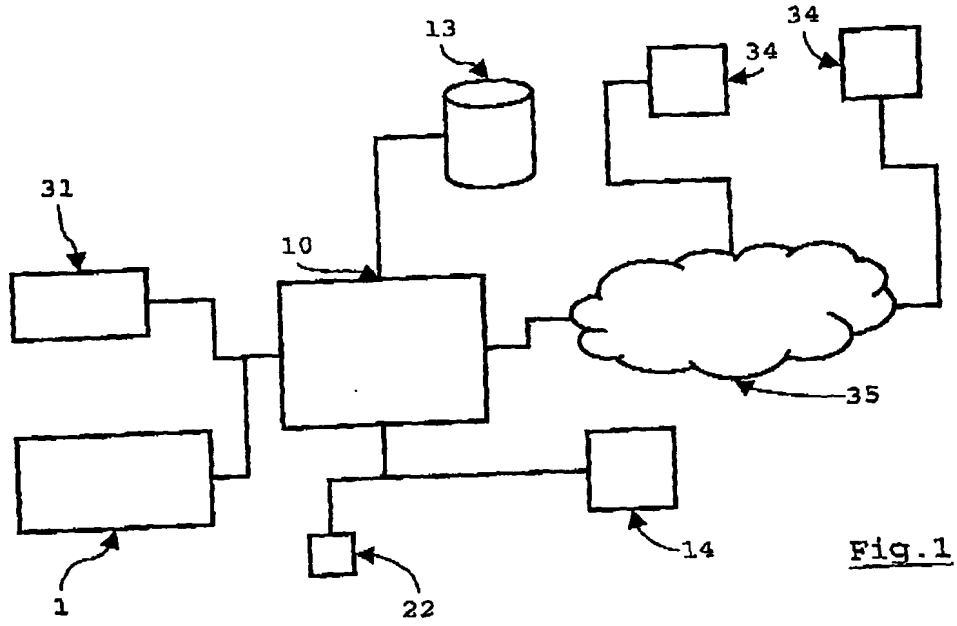


Fig.1

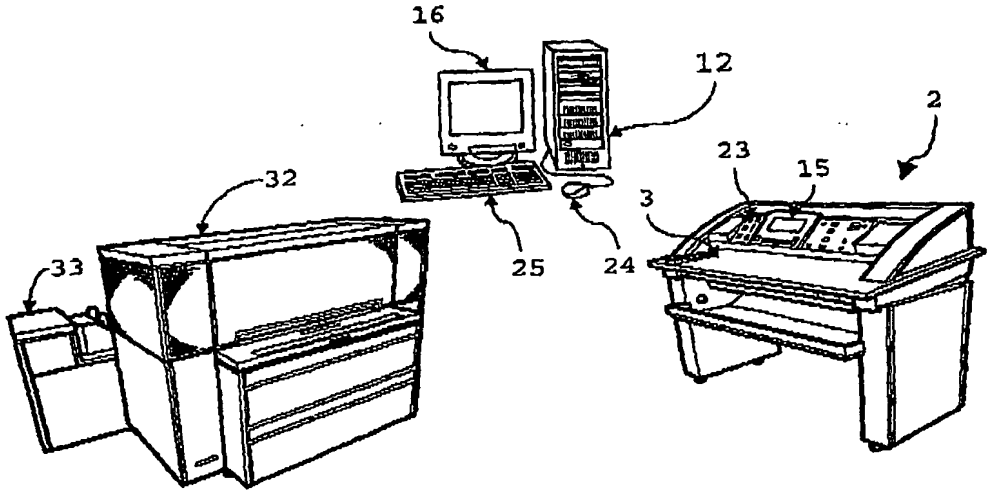


Fig.2

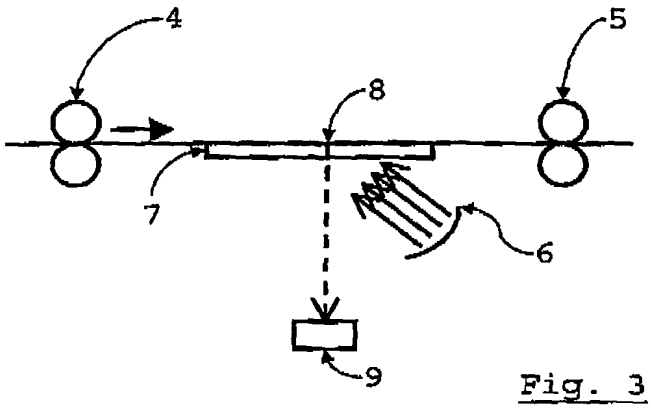


Fig. 3

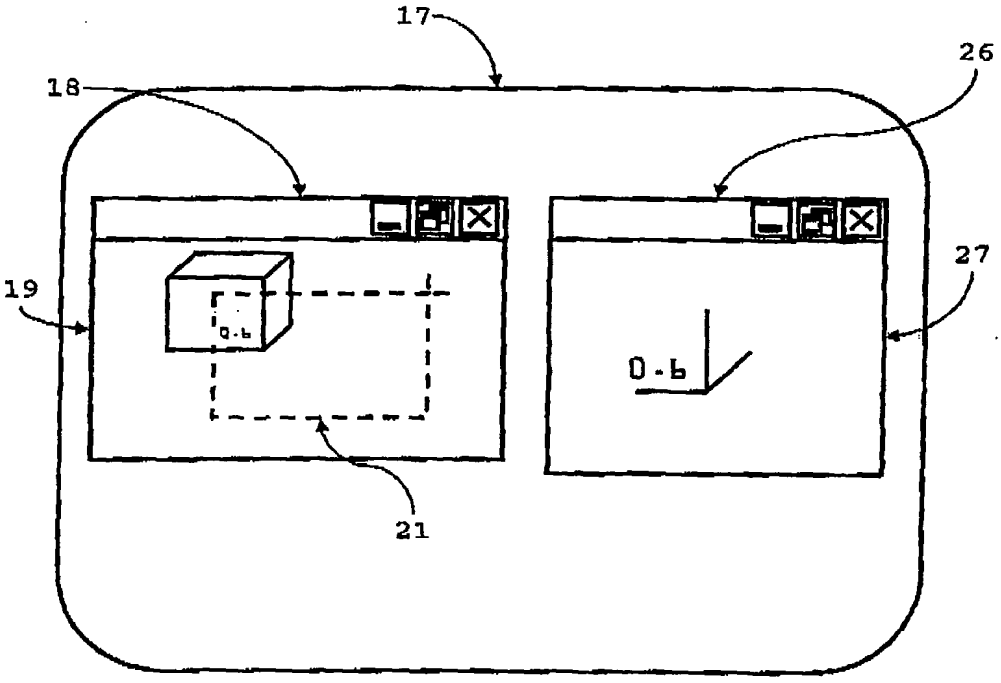
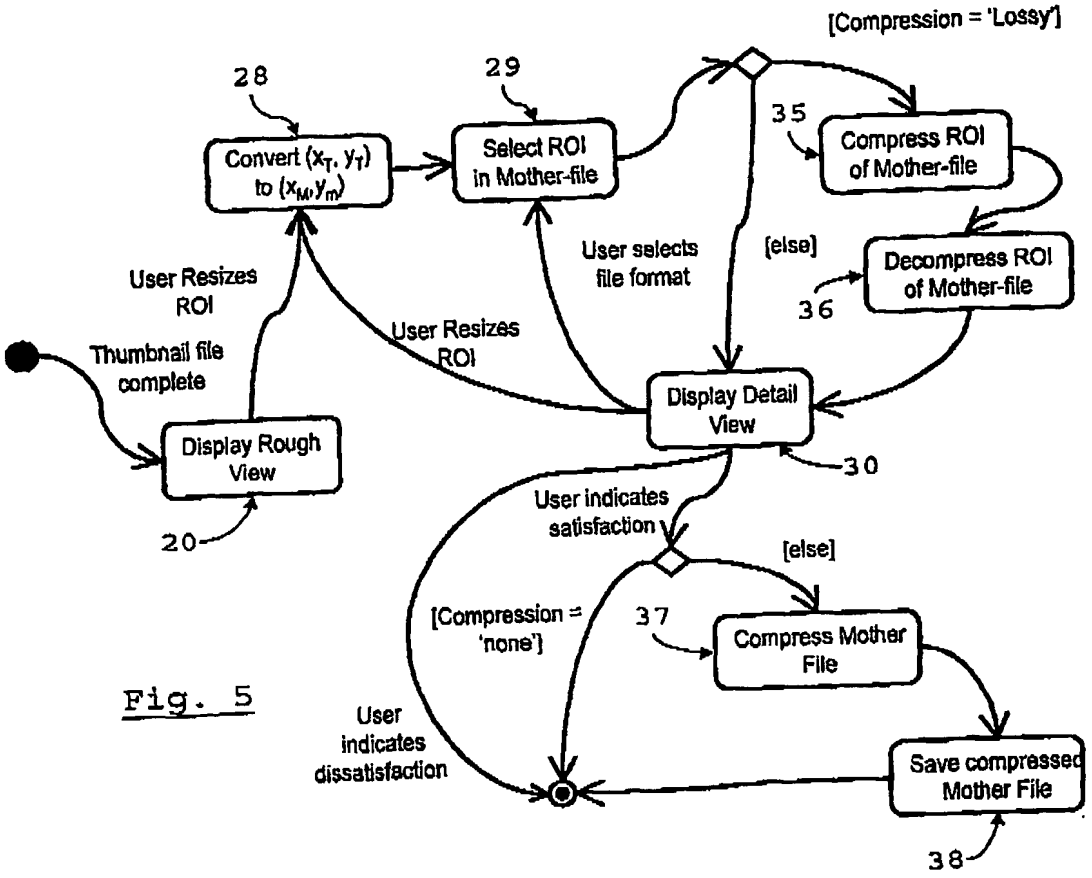


Fig. 4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29
35
Convert (x_T, y_T) to (x_M,y_m)
Select ROI in Mother-file
Compress ROI of Mother-file
User Resizes ROI
User selects file format
[else]
Decompress ROI of Mother-file
36
User Resizes ROI
Thumbnail file complete
Display Detail View
Display Rough View
30
20
User indicates satisfaction
[else]
[Compression = 'none']
37
Compress Mother File
User indicates dissatisfaction
Save compressed Mother File
38

Fig. 5